AMENDMENTS TO CLAIMS

Claim 1 (Cancelled).

Claim 2 (New): A method for drilling for petroleum, comprising the steps of

(a) erecting a derrick assembly on the ground;

(b) mounting a drill on said derrick assembly, said drill including a hollow drill pipe having an upper end and a lower end and a drill bit attached to the lower end;

(c) mounting a rotary assembly at said derrick assembly to provide motive power to rotate said drill bit in the ground to produce drill bit cuttings;

(d) mounting a drilling mud circulation system at said derrick assembly to direct primary drilling mud into said upper end of said drill pipe, down through said drill pipe, out the lower end of said drill pipe, and up through a hole in the ground to produce auxiliary drilling mud containing drill bit cuttings;

(e) providing a source of primary drilling mud for said circulation system, said mud including water and clay and substantially free of drill bit cuttings;

(f) providing a first particle separation apparatus including

(i) at least one stationary wall defining a stationary separation chamber,

(ii) a feed inlet orifice formed in said chamber,

(iii) at least one rotary distributor in said chamber including a rotating distribution disk including an upper surface,

(iv) a drive system for rotatably driving said rotary distributor to rotate said disk and said upper surface at a speed in the range of 500 RPM to 10,000 RPM,

(v) at least first and second outlets formed in said wall,

(vi) an open particle circulation space intermediate said disk system and said outlet and circumscribed by a portion of said wall, said outlet opening into said particle circulation space,

(vii) a charging system for charging auxiliary drilling mud containing drill bit cuttings through said orifice into said separation chamber toward said rotary distributor such that said auxiliary drilling mud, at least in part, impinges said upper surface, said rotary distributor providing the motive power to move

at least a portion of the auxiliary drilling mud outwardly over said upper surface and into said chamber away from said rotary distributor,

a first portion of said auxiliary drilling mud over said upper surface and into said chamber in a primary continuous helical path of travel away from said rotary distributor and said orifice through said circulation space toward and into said outlet,

a second portion of the auxiliary drilling mud in a secondary recirculating helical path of travel away from said rotary distributor and said orifice through said circulation space toward said outlet and away from said outlet back toward said rotary distributor:

(g) rotating said drill into the ground with said rotary assembly to form said hole in the

ground and produce drill bit cuttings in said hole, said hole having a top and a side;

(h) circulating primary drilling mud with said mud circulation system along a path down into said upper end of said drill pipe, through said drill pipe, out said lower end of said drill pipe, up through said hole intermediate said drill pipe and said side of said hole, and out through said top of said hole, to produce said auxiliary drilling mud containing drill bit cuttings;

(i) operating said a drive system to rotate said upper surface at a speed in the range of 500 RPM to 10,000 RPM;

(j) transporting to said charging system said auxiliary drilling mud, said charging system directing said auxiliary drilling mud through said inlet orifice into said stationary separation chamber toward said rotary distributor such that the material directed through said inlet orifice is at least fifty percent by weight liquid and such that said auxiliary drilling mud, at least in part, impinges said rotating upper surface such that

(i) first dry material including clay passes outwardly from within said stationary wall through said first outlet, and

(ii) second dry material passes outwardly from within said stationary wall through said second outlet;

(k) transporting at least said first dry material to a landfill; and,

(l) depositing said first dry material in the landfill.

Claim 3 (New): A method for drilling for petroleum, comprising the steps of

(a) erecting a derrick assembly on the ground;

(b) mounting a drill on said derrick assembly, said drill including a hollow drill pipe

having an upper end and a lower end and a drill bit attached to the lower end;

(c) mounting a rotary assembly at said derrick assembly to provide motive power to rotate said drill bit in the ground to produce drill bit cuttings;

(d) mounting a drilling mud circulation system at said derrick assembly to direct primary drilling mud into said upper end of said drill pipe, down through said drill pipe, out the lower end of said drill pipe, and up through a hole in the ground to produce auxiliary drilling mud containing drill bit cuttings;

(e) providing a source of said primary drilling mud for said circulation system, said mud including water and clay and substantially free of drill bit cuttings;

(f) providing a particle separation apparatus including

(i) a first stationary wall defining a first stationary separation chamber,

(ii) a feed inlet orifice formed in said chamber,

(iii) at least one rotary distributor including

a first end of a hollow rotating shaft, said first end positioned in said chamber, said rotating shaft also including a second end located outside said chamber, and

a first distribution disk mounted on said first end to rotate in said chamber simultaneously with said shaft and including an upper surface,

(iv) at least a first outlet formed in said wall,

(vi) an open first particle circulation space intermediate said disk and said outlet and circumscribed by a portion of said wall, said outlet opening into said particle circulation space,

(vii) a charging system for charging auxiliary drilling mud through said orifice into

said first separation chamber toward said disk such that said auxiliary drilling mud, at least in part, impinges said upper surface, said rotating distribution disk providing the motive power to move

at least a portion of said auxiliary drilling mud outwardly over said upper surface and into said chamber away from said disc,

a first portion of the auxiliary drilling mud over said upper surface and into said chamber in a primary continuous helical path of travel away from said rotary disc and said orifice through said circulation space toward and into and through said outlet as a dry fraction including clay,

a second portion of the auxiliary drilling mud in a secondary recirculating helical path of travel away from said rotary distributor and said orifice through said circulation space toward said outlet and away from said outlet back toward said rotary distributor and into said first end of and rotatably through said hollow rotary shaft,

(viii) a second stationary wall defining a second stationary separation chamber,

(ix) at least a second rotary distributor including

said second end of said hollow rotating shaft positioned in said second chamber, and

a second distribution disk mounted on said second end to rotate in said second chamber simultaneously with said second end and including an upper surface,

(x) at least a second outlet formed in said second wall,

(xi) an open second particle circulation space intermediate said second disk and

said second outlet and circumscribed by a portion of said second wall, said second end of said hollow rotary shaft opening into said second particle circulation space such that said second portion of said auxiliary drilling mud rotatably exits from said second end, travels toward said second disk such that said second portion, at least in part, impinges said upper surface of said second disk, said second rotating disk providing the motive power to move

at least a portion of the auxiliary drilling mud outwardly over said upper surface of said second disk and into said second chamber away from said second disk,

a primary portion of said second portion over said upper surface of said second disk and into said second chamber in a primary continuous helical path of travel away from said second disk away from said second end through said second circulation space toward and into and through said second outlet as a liquid portion including water,

a secondary portion of said second portion in a secondary recirculating helical path of travel away from said second disk and said second end through said second circulation space toward said second outlet and then away from said second outlet back toward said second end of said rotary shaft,

(xii) a drive system to rotatably turn said hollow rotary shaft at a speed in the range of 500 RPM to 10,000 RPM, and

(xiii) a return system to direct said liquid portion into said source of said primary drilling mud before said primary drilling mud is directed into

said upper end of said drill pipe;

(h) rotating said drill into the ground with said rotary assembly to form said hole in the ground and produce drill bit cuttings in said hole, said hole having a top and a side;

(i) operating said drilling mud circulation system and said return system to

direct said liquid portion into said primary drill mud before said primary drilling mud is directed into said upper end of said drill pipe, and

circulate drilling mud with said mud circulation system along a path down into said upper end of said drill pipe, through said drill pipe, out said lower end of said drill pipe, up through said hole intermediate said drill pipe and said side of said hole, and out through said top of said hole, to produce said auxiliary drilling mud containing drill bit cuttings;

(j) operating said drive system to rotate said upper surface of said first distribution disk and of said second distribution disk at a speed in the range of 500 RPM to 10,000 RPM;

(k) transporting to said charging system said auxiliary drilling mud, said charging system directing said auxiliary drilling mud through said inlet orifice into said first stationary separation chamber toward said first distribution disk such that the material directed through said inlet orifice is at least fifty percent by weight liquid and such that said auxiliary drilling mud, at least in part, impinges said rotating upper surface of said first distribution disk such that

(i) first dry material including clay passes outwardly from within said stationary wall into and through said first outlet,

(ii) second dry material passes outwardly from within said stationary wall into and through said second outlet,

(iii) said second portion rotatably travels into said first end of said hollow rotary shaft, through said hollow shaft, and out said second end of said hollow rotary shaft into said second separation chamber, and

(iv) said secondary portion of said second portion travels into and through said second outlet as a liquid portion including water;

(l) operating said return system to direct said liquid portion to said source of said primary drilling mud before said primary drilling mud is directed into said upper end of said drill pipe;

(m) transporting at least said first dry material to a landfill; and,

(n) depositing said first dry material in the landfill.

Claim 4 (New): The method of Claim 3 wherein said liquid portion is substantially all water.

Claim 5 (New): The method of Claim 3 wherein said circulation spaces are toroidal-shaped.

Claim 6 (New): The method of Claim 2 wherein said circulation space is toroidal-shaped.

Claim 7 (New): The method of Claim 3 wherein said liquid portion is substantially all water.

Claim 8 (New): A method for drilling for petroleum, comprising the steps of

(a) erecting a derrick assembly on the ground;

(b) mounting a drill on said derrick assembly, said drill including a hollow drill pipe having an upper end and a lower end and a drill bit attached to the lower end;

(c) mounting a rotary assembly at said derrick assembly to provide motive power to

rotate said drill bit in the ground to produce drill bit cuttings;

(d) mounting a drilling mud circulation system at said derrick assembly to direct primary drilling mud into said upper end of said drill pipe, down through said drill pipe, out the lower end of said drill pipe, and up through a hole in the ground to produce auxiliary drilling mud containing drill bit cuttings;

(e) providing a source of said primary drilling mud for said circulation system, said mud substantially free of drill bit cuttings and including water, clay and at least one petroleum hydrocarbon;

(f) providing a particle separation apparatus including

(i) a first stationary wall defining a first stationary separation chamber,

(ii) a feed inlet orifice formed in said chamber,

(iii) at least one rotary distributor including

a first end of a hollow rotating shaft, said first end positioned in said chamber, said rotating shaft also including a second end located outside said chamber, and

a first distribution disk mounted on said first end to rotate in said chamber simultaneously with said shaft and including an upper surface,

(iv) at least a first outlet formed in said wall,

(vi) an open first particle circulation space intermediate said disk and said outlet and circumscribed by a portion of said wall, said outlet opening into said particle circulation space,

(vii) a charging system for charging auxiliary drilling mud through said orifice into said first separation chamber toward said disk such that said auxiliary drilling

mud, at least in part, impinges said upper surface, said rotating distribution disk providing the motive power to move

at least a portion of said auxiliary drilling mud outwardly over said upper surface and into said chamber away from said disc,

a first portion of the auxiliary drilling mud over said upper surface and into said chamber in a primary continuous helical path of travel away from said rotary disc and said orifice through said circulation space toward and into and through said outlet as a dry fraction including clay,

a second portion of the auxiliary drilling mud in a secondary recirculating helical path of travel away from said rotary distributor and said orifice through said circulation space toward said outlet and away from said outlet back toward said rotary distributor and into said first end of and rotatably through said hollow rotary shaft,

(viii) a second stationary wall defining a second stationary separation chamber,

(ix) at least a second rotary distributor including

said second end of said hollow rotating shaft positioned in said second chamber, and

a second distribution disk mounted on said second end to rotate in said second chamber simultaneously with said second end and including an upper surface,

(x) at least a second and third outlets formed in said second wall,

(xi) an open second particle circulation space intermediate said second disk and said second outlet and circumscribed by a portion of said second wall, said

second end of said hollow rotary shaft opening into said second particle circulation space such that said second portion of said auxiliary drilling mud rotatably exits from said second end, travels toward said second disk such that said second portion, at least in part, impinges said upper surface of said second disk, said second rotating disk providing the motive power to move

at least a portion of the auxiliary drilling mud outwardly over said upper surface of said second disk and into said second chamber away from said second disk,

a primary portion of said second portion into said second chamber in a primary helical path of travel away from said second disk and away from said second end through said second circulation space toward and into and through said second outlet as a first liquid portion including a portion of said water,

a secondary portion of said second portion in a secondary recirculating helical path of travel away from said second disk and said second end through said second circulation space toward said second outlet and then away from said second outlet back toward said second end of said rotary shaft,

a tertiary portion of said second portion into said second chamber in a primary helical path of travel away from said second disk and away from said second end through said second circulation space toward and into and through said third outlet as a second liquid portion including a portion of said petroleum hydrocarbon,

(xii) a drive system to rotatably turn said hollow rotary shaft at a speed in

the range of 500 RPM to 10,000 RPM, and

(xiii) a return system to direct said liquid portion into said source of said primary drilling mud before said primary drilling mud is directed into said upper end of said drill pipe;

(h) rotating said drill into the ground with said rotary assembly to form said hole in the ground and produce drill bit cuttings in said hole, said hole having a top and a side;

(i) operating said drilling mud circulation system and said return system to

direct said liquid portion into said primary drill mud before said primary drilling mud is directed into said upper end of said drill pipe, and

circulate drilling mud with said mud circulation system along a path down into said upper end of said drill pipe, through said drill pipe, out said lower end of said drill pipe, up through said hole intermediate said drill pipe and said side of said hole, and out through said top of said hole, to produce said auxiliary drilling mud containing drill bit cuttings;

(j) operating said drive system to rotate said upper surface of said first distribution disk and of said second distribution disk at a speed in the range of 500 RPM to 10,000 RPM;

(k) transporting to said charging system said auxiliary drilling mud, said charging system directing said auxiliary drilling mud through said inlet orifice into said first stationary separation chamber toward said first distribution disk such that the material directed through said inlet orifice is at least fifty percent by weight liquid and such that said auxiliary drilling mud, at least in part, impinges said rotating upper surface of said first distribution disk such that

(i) first dry material including clay passes outwardly from within said stationary

wall into and through said first outlet,

(ii) second dry material passes outwardly from within said stationary wall into and through said second outlet,

(iii) said second portion rotatably travels into said first end of said hollow rotary shaft, through said hollow shaft, and out said second end of said hollow rotary shaft into said second separation chamber,

(iv) said secondary portion of said second portion travels into and through said second outlet as a first liquid portion including water, and

(v) said tertiary portion of said second portion travels into and through said third outlet as a second liquid portion including petroleum hydrocarbon;

(l) operating said return system to direct said first liquid portion to said source of said primary drilling mud before said primary drilling mud is directed into said upper end of said drill pipe;

(m) transporting at least said first dry material to a landfill; and,

(n) depositing said first dry material in the landfill.

Claim 9 (New): The method of Claim 8 wherein said first liquid portion is substantially all water and said second liquid portion is substantially all petroleum hydrocarbon.

Claim 10 (New): The method of Claim 5 wherein said circulation spaces each have a conical base with a side at an angle (A) from the vertical and with a height (F) wherein the ratio of said angle (A) to said height (F) is in the range of 2:1 to 12:1.

Claim 11 (New): The method of Claim 6 wherein said circulation space has a conical base

with a side at an angle (A) from the vertical and with a height (F) wherein the ratio of said angle (A) to said height (F) is in the range of 2:1 to 12:1.

Claim 12 (New): The method of Claim 11 wherein said circulation space has a cylindrical portion with a side having a height (B) that is less than about four times the diameter (C) of said cylindrical portion.

Claim 13 (New): The method of Claim 10 wherein said circulation spaces each have a cylindrical portion with a side having a height (B) that is less than about four times the diameter (C) of said cylindrical portion.

Claim 14 (New): The method of claim 12 wherein said particle separation apparatus is shaped and dimension to permit one hundred to two-hundred and fifty gallons per minute of said auxiliary drilling mud to be processed by said particle separation apparatus.

Claim 15 (New): The method of Claim 13 wherein said particle separation apparatus is shaped and dimensioned to permit one hundred to two-hundred and fifty gallons per minute of said auxiliary drilling mud to be processed by said particle separation apparatus.